

**St. Lucie Nuclear Station SLRA: Breakout Questions – PWR Internals Review**

AMP: SLRA Appendix B, Section B2.3.7, “Reactor Vessel Internals”

AMP FSAR Supplement: SLRA Appendix A, Section 19.2.2.7, “Reactor Vessel Internals”

SLRA FSAR Supplement Commitment: SLRA UFSAR Supplement Table 19-3, Item 10

AMR Item Reference Table (Table 1s): Table 3.1.1 - Items 052a, 052b, 052c, 056a, 056b, 056c, 118 and 119

AMR Item Reference Table (Table 2s): Table 3.1.2-2 - All AMR Items Referenced to AMP B2.3.7

Assigned Technical Review Package (TRP): #16

	<b>Staff Member Name</b>	<b>Concurrence Signature Date</b>
<b>Technical Primary Reviewer</b>	James Medoff	Jan. 4, 2022
<b>Technical Peer Reviewer</b>	John Tsao	January 4, 2022
<b>Technical Branch Chief</b>	Angie Buford	January 11, 2022
<b>Breakout Session</b>	<i>Date/Time</i>	<i>To be filled in by PM</i>

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Breakout Session Attendance List

Applicant Staff	NRC staff
<i>To be filled out by Brian Harris (new DNLR/NLRB PM for St. Lucie SLRA) during breakout session for PWR Reactor Vessel Internals AMP and AMRs</i>	

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### **Abbreviations Used in the TRP Audit Question/Topic Table**

#### **Abbreviations for Aging Effects**

Loss of fracture toughness: LOFT

Loss of Material: LOM

Loss of preload: LOP

Changes in Dimension: CID

#### **Abbreviations for Applicable Aging Mechanisms**

Stress Corrosion Cracking: SCC

Irradiation-Assisted Stress Corrosion Cracking: IASCC

Irradiation-Enhanced Stress Relaxation or Creep: ISR/IC

Fatigue (or Cyclical Loading): F-CL

Neutron Irradiation Embrittlement: IE

Void Swelling (or Distortion): VS-D

Thermal-Aging Embrittlement: TE

#### **Abbreviations for Reactor Internals Assemblies or Component Commodity Groups**

Core Element Assembly: CEA

Control Support Barrel Assembly: CSBA

Lower Support Structure: LSS

Reactor Vessel Internal (General Terminology): RVI

Core Shroud Assembly: CSA

In-Core Instrumentation: ICI

Upper Internals Assembly: UIA

#### **Other Abbreviations**

Electric Power Research Institute: EPRI

Pressurized Water Reactor Owner’s Group: PWROG

Materials Reliability Program: MRP

Nuclear Energy Institute: NEI

### **Risk-Informed Approach to the Staff’s Audit of SLRA AMP B2.3.7**

- The Reactor Vessel Internals Program is a risk-Informed, sampling Based Program based on EPRI MRP-227, Rev. 1-A guidelines, as adjusted by the applicant’s gap analysis for the RVI components. Given that all operating experience (OpE - generic or plant-specific) is disseminated to EPRI for compilation and analysis, the staff will rely on the word searches performed by the applicant for relevant plant-specific and generic OpE and will not need to perform its own independent word search for relevant RVI OpE.

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- The applicant is using EPRI MRP-175, Revision 1; MRP-191, Revision 2; and MRP-2018-022 for the gap analysis adjusted basis for the AMP. In NRC Interim Staff Guidance Document (ISG) No. SLR-ISG-2021-01-PWRVI (ADAMS Accession No. ML20217L203), the staff could not preclude the applicant from using these types of additional guidelines for the gap analysis results of the AMP. However, these types of proprietary documents are not formally reviewed by the staff for acceptance. Thus, the staff may ask questions regarding the validity of gap analysis results that may derive from the EPRI MRP conclusions in these supplemental guidelines. This approach is consistent with what was reflected in Appendix G of the staff’s referenced ISG.
- The breakout session for SLRA AMP B2.3.7 and the related AMRs is the appropriate session for discussing topics related to the RVI AMP and its related AMR items. The staff may raise questions during the scheduled audit breakout session, but will not use the breakout session as a basis for assessing the adequacy of the applicant’s verbal response to any given audit question. However, this is not to be interpreted that the staff is accepting of (or will be rejecting) a given statement, position or basis that may be made or implied in a given response to a specified audit question or in relation to given aspects of the AMP and related AMRs. Instead, if it is needed, the staff will use its RAI and RAI resolution processes to assess the validity of any applicant-made positions or technical/regulatory bases for the referenced AMP and related AMR items. The RAI discussion sessions (as may be scheduled as remote MS-TEAMS teleconferences by the assigned NRR project manager) are the more appropriate SLRA-review sessions to articulate any differences in technical or regulatory positions that may arise between the NRR staff members and the applicant’s staff members.

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**Audit Breakout Topics and Questions for AMP B2.3.7, Including Gap Analysis Results and OpE**

Generic Discussion Topics – NOTE: Staff Will Inform NextEra Energy of any Additional Reactor Internal-Related Documents Needing Posting to the Audit Portal After the Audit Breakout Session for SLRA AMP B.2.3.7 and Related SLRA AMR Items

Question/Topic Number	SLRA Section/Table	SLRA Pages	MRP-227, Rev. 1-A or MRP-2018-022 Table (T) References	Background / Information Gap	Discussion Topic / Question or Request	Outcome of Discussion
1	SLRA Section B2.3.7; SLRA Appendix C	B-64 – B-74; C-1 – C-10	NA	<p><i>Topic: Formal Gap Analysis for the St. Lucie 1 and 2 RVI Components</i></p> <p>The staff has not located a formal gap analysis in the SLRA Audit Portal directory for SLRA AMP B2.3.7.</p>	<p>The staff cannot perceive whether SLRA Appendix C is considered the formal gap analysis for the SLRA or whether the applicant considers the EPRI MRP-2018-022/MRP-191, Rev 2 bases to be the formal gap analysis report for the RVI components, or whether there is a separate record for St. Lucie RVI components that contains the formal gap analysis for the AMP. The staff requests that the applicant identify the formal record that contains the fully detailed formal RVI gap for the RVI AMP. If the formal gap analysis is contained in a St. Lucie record other than SLRA Appendix C or EPRI MRP-2018-022, the staff requests that the applicant post that analysis to the SLRA Audit Portal for SLRA AMP B2.3.7</p>	

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2	SLRA Section B2.3.7; SLRA Appendix C	B-64 – B-74; C-1 – C-10	NA	<i>Topic: Scope of Program</i>	Applicant should clarify whether the scope of the Reactor Vessel Internals Program includes the Pressurized Water Reactor Owners Group’s (PWROG’s) acceptance criteria and data analysis criteria in WCAP-17096 per the reference to the WCAP report in Chapter 7 of MRP-227, Rev. 1-A. If so, the applicant should clarify which version of WCAP-17096 is being applicable to the Program.	
3	SLRA Table 3.1.2-2; SLRA Section B2.3.7; SLRA Appendix C	3.1-59 – 3.1-63 B-64 – B-74; C-1 – C-10	NA	<i>Topic: St. Lucie RVI Code Shroud Design Confirmations</i>	<p>1) Applicant to confirm that the St. Lucie unit-specific core shroud assemblies utilize a welded core shroud design in two vertical sections.</p> <p>2) Applicant to confirm whether there are any aspects of the St. Lucie RVI design that deviates from the assumed RVI design for CE-designed reactors in MRP-227, Rev. 1-A</p> <p>3) Applicant to confirm that core shroud tie rods are a</p>	

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					bolted design with bolts and nuts.  4) Applicant to confirm whether or not the 80-Year Program will still implement confirmations for maximum power ratio, average power density, and top of fuel-to-upper core plate height, as specified per MRP 2013-025.	

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Reactor Internal AMR Items for SLRA Table 3.1.2-2 – Comparisons to SLRA AMP B2.3.7, PWR Vessel Internals and SLRA Appendix C Gap Analysis Information (Table Includes Component-Based Items Not Needing Discussion to Indicate That Staff Has No Issues with the Items)

Question/Topic Number	SLRA Pages	MRP-227, Rev. 1-A or MRP-2018-022 Table References	Background / Information Gap	Discussion Topic / Question or Request or Staff comments.	Outcome of Discussion
1	3.1-59	NA	<p><b>Referenced SLRA Table 3.1.2-2 AMR Item:</b> <i>No Additional Measures Components</i></p> <p>The referenced AMR item is a general commodity group-based AMR item for all RVI components placed in the EPRI MRP “No Additional Measures” (NAM) category.</p>	No discussions needed for the referenced NAM-based AMR item.	
2	3.1-59	MRP-227, Rev. 1-A, Table 4-8, Item C16	<p><b>Referenced SLRA Table 3.1.2-2 AMR Item:</b> <i>Core support barrel assembly (CSBA) upper flange</i></p> <p>Component is “Existing Program” component for the mechanism of wear.</p>	No discussions needed for the referenced AMR Item or for the AMP’s “Existing Program” basis for the CSBA upper flange components.	
3	3.1-59	MRP-227, Rev. 1-A, Table 4-5, Item C2.1	<p><b>Referenced SLRA Table 3.1.2-2 AMR Items (2 of them):</b> <i>Core shroud assembly (CSA) remaining axial welds</i></p> <p>The remaining axial welds in the core shroud remain as Expansion-category components for the program; the linked Primary-category components are the core shroud plate-to-former plate welds. The remaining axial welds screen in for mechanisms of IASCC and IE.</p>	No discussions necessary for the two AMR items or the AMP’s Expansion-category basis for the CSA remaining axial welds.	



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4	3.1-59	MRP-227, Rev. 1-A, Table 4-2, Item C2	<p><b>Referenced SLRA Table 3.1.2-2 AMR Items (2 Items):</b> <i>Core shroud assembly (CSA) shroud plate-to-former plate welds</i></p> <p>The Primary shroud plate-to-former plate welds link to the Expansion-category “remaining [shroud] axial welds.” The shroud plate-to-former plate welds screen in for mechanisms of IASCC and IE.</p>	<p>No discussions necessary for the two AMR items or the AMP’s Primary-category basis for the CSA shroud plate-to-former plate welds.</p>	
5	3.1-59		<p><b>Referenced SLRA Table 3.1.2-2 AMR Items (2 items):</b> <i>Core shroud assembly – core shroud tie rods</i></p> <p>The tie rods are new gap analysis adjusted “Primary” category components for the 80-year program. SLRA Table 3.1.2-2 includes an AMR item on cracking of the tie rods (i.e., for irradiation-assisted stress corrosion cracking [IASCC] and fatigue mechanisms) and an AMR item on loss of material (LOM) and changes in dimension (CID) (i.e., to cover the non-cracking mechanisms of wear and void swelling/distortion [VS-D]). The corresponding line item for the core shroud tie rods also has the tie rods as screening in for the non-cracking mechanism of irradiation embrittlement (IE) and irradiation-enhanced stress relaxation or creep (ISR/IC).</p>	<p>Why doesn’t the AMR item for the core shroud tie rods (at the bottom of page 3.1-59) include the aging effects of “loss of fracture toughness” (LOFT) and “loss of preload” (LOP) in addition to the aging effects of LOM and CID (i.e., in order to cover the non-cracking mechanisms of wear, VS-D, IE, and ISR/IC)?</p>	

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6	3.1-60; C-5	MRP-227, Rev. 1-A Table 4-8, Item C17	<p><b>Referenced SLRA Table 3.1.2-2 AMR Item:</b> <i>Core stabilizing lugs, shims, and bolts</i></p> <p>The referenced AMR item for the core stabilizing lugs, shims, and bolts at the top of SLRA page 3.1-60 reference use of SLRA Item 3.1-1, 052c and GALL-SLR Item IV.B3.RP-320a, which identify these components as “Existing Program” category components for what will be the 80-year version of the AMP. However, the corresponding line item for these components in SLRA Appendix C (on SLRA page C-5) has the core stabilizing lugs, shims, and bolts are elevated “Primary” category components.</p> <p>According to the gap analysis, the components screen in for the aging mechanisms of stress corrosion cracking (SCC) and wear.</p>	<p>Applicant should identify which EPRI MRP category will be applied to the core stabilizing lugs, shims, and bolts under the 80-year version of the PWR Vessel Internals Program. If the category for the components has been elevated to the “Primary” category, shouldn’t the appropriate AMR cross-references in the AMR item be SLRA Item 3.1-1, 118 and GALL-SLR Item IV.B3.RP-423 (as updated in SLR-ISG-2021-01-PWRVI)?</p> <p>Alternatively, the Applicant can opt to confirm that the AMP will be performing VT-3 visual inspections of these components on a 10-Year augmented inspection basis regardless of whether the AMP categorizes the components as newly elevated “Primary-category components or remaining Existing Program-category components for the program. If this is the case, then adjustments of any potential GALL-SLR AMR item reference inaccuracies in the AMR item would be un-necessary.</p>	

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7	3.1-60; C-7 – C-9	MRP-227, Rev. 1-A Table 4-5, Item C6.1 for the CSBA MAWs  MRP-227, Rev. 1-A Table 4-5, Item C6.2 for the CSBA LAWs	<p><b>Referenced SLRA Table 3.1.2-2 AMR Items (4 items):</b> <i>Core support barrel assembly (CSBA) lower axial welds (LAWs – two AMR items total) and CSBA middle axial welds (MAWs – two AMR items total)</i></p> <p>The AMR items on page 3.1-60 for the CSBA MAWs and the CSBA LAWs cross-reference to SLRA Items 3.1-1, 052b and 056b respectively, which establishes the CSBA MAWs and LAWs as Expansion-category components for the AMP. In MRP-227, Rev. 1-A, the CSBA MAWs and LAWs were designated as Expansion-category components for the CSBA middle girth welds (MGWs), which are maintained as Primary-category components for the AMP; however, in the SLRA Appendix C, the applicant has elevated the CSBA lower girth welds from being Expansion-category components to being Primary category components for the 80-Year version of the AMP.</p> <p>The applicant uses the *-based Notes on page C-7 – C-9 to clarify which CSBA cylinder girth welds will be the linked Primary-category components for the CSBA MAWs and LAWs under the gap-analysis adjusted program; The notes on pages C-7 - C-9 do not provide sufficient information to clarify whether the CSBA MGWs, the CSBA LGWs, or CSBA MGWs and LGWs are the linked Primary components for the Expansion-category CSBA MAWs and LAWs.</p>	<p>No issues with the actual referenced AMR items. However, for the AMP review, applicant is requested to discuss and clarify which of the CSBA cylinder girth welds (i.e., MGWs, LGWs, or MGWs and LGWs) will be the linked Primary-category welds for the Expansion-category CSBA LAWs CSBA and for the Expansion-category MAWs under the 80-Year version of the AMP.</p> <p>As part of the discussion, the applicant should explain how the gap analysis-adjusted Primary-to-Expansion category relationships for the Expansion-category CSBA MAWs and LAWs compare to those for the CSBA MAWs and LAWs in Items C6.1 and C6.2 of Table 4-5 in the MRP-227, Rev. 1-A report.</p> <p>Additionally, in light of the St. Lucie operating experience with cracking of the St. Lucie Unit 1 CSBA MAWs (year 2018 event and year 2019 follow-up inspections of the MAWs), the applicant should be prepared to discuss why the CSBA MAWs and LAWs can remain as Expansion-category components for the 80-year version of the AMP.</p>	
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8	3.1-60; C-7 – C-9	<p>MRP-227, Rev. 1-A, Table 4-2, Item C6 for CSBA MGWs</p> <p>MRP-227, Rev. 1-A, Table 4-5, Item C5.1 for CSBA LGWs</p>	<p><b>AMR Items (4 items):</b> Core support barrel assembly (CSBA) lower girth welds (LGWs – two AMR items total) and CSBA middle girth welds (MGWs – two AMR items total)</p> <p>The gap analysis maintains the CSBA MGWs as Primary-category components for the AMP. Additionally, in MRP-227, Rev. 1-A, the CSBA LGWs were designated as Expansion-category components for the 60-year based programs, with the CSBA upper flange welds (UFWs) being the linked Primary-category components under Item C5 in Table 4-2 of the report; however, on SLRA pages C-7 – C-9, the applicant elevates the EPRI MRP category for the CSBA LGWs from being Expansion-category components for the AMP to being Primary-category components for the 80-Year version of the AMP. While the staff has issue with maintaining the CSBA MGWs as Primary-category components and elevating the CSBA LGWs to Primary-category status, notes on SLRA pages C-7 – C-9 do not have sufficient information to establish which set of Expansion-category components constitutes the Expansion-category components for the CSBA MGWs and for the CSBA LGWs under the 80-Year version of the AMP.</p>	<p>No issues with the actual referenced AMR items. However, for the AMP review, the applicant is requested to discuss and identify the set of Expansion-category components that will constitute the Expansion-category components for the Primary category CSBA MGWs and for the newly elevated Primary-category CSBA LGWs (e.g., the CSBA middle axial welds (MAWs), CSBA lower axial welds (LAWs), lower support structure (LSS) core support columns, and the fuel alignment plates, or any combination of these Expansion category components).</p> <p>As part of the discussion, the applicant should explain how the gap analysis-adjusted Primary-to-Expansion category relationships for the CSBA MGWs and LGWs compare to those for the CSBA MGWs and LGWs in the MRP-227, Rev. 1-A report.</p>	

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9	3.1-60; C-5 – C-9	MRP-227, Rev. 1-A, Table 4-2, Item C5	<p><b>AMR Item:</b> <i>Core support barrel assembly (CSBA) upper flanges welds (UFWs)</i></p> <p>The CSBA UFWs will remain as Primary-category components for the 80-Year version of the AMP. In Item C5 of Table 4.2 in the MRP-277, Rev. 1-A report, the linked Expansion-category components for the Primary-category CSBA UFWs were designated as follows: (1) CSBA upper girth weld (UGW) per Item C5.2 in the MRP report, (2) the CSBA lower girth weld/flange weld (LGW/LFW) per Item C5.1 in the MRP report, (3) the CSBA upper axial welds (UAWs) per Item C5.3 in the MRP report, and (4) the core support columns of the lower support structure per Item C6.3 in the MRP report.</p> <p>In the gap analysis of SLRA Appendix C and in the AMR items for the CSBA LGWs in SLRA Table 3.1.2-2, the applicant has elevated the CSBA LGWs (LFWs) to Primary-category status, which from the staff's understanding, would eliminate the CSBA LGW/LFW types as designated Expansion-link components for the CSBA UFWs; yet in the gap analysis the applicant does not define or not address in the changes in designated Expansion-link components for the Primary-category CSBA UFWs.</p>	<p>No issues with the AMR item.</p> <p>For the AMP and gap analysis basis, the CSBA UFWs already screen in for stress corrosion cracking. The applicant is requested to clarify whether the 80-year project fluence for the UFWs is high enough to screen the CSBA UFWs in for irradiation-assisted stress corrosion cracking (IASCC) under the 80-Year version of the AMP.</p> <p>Additionally, for the AMP and the gap analysis, the applicant should discuss the set of Expansion-category components that will actually constitute the Expansion-category components for the Primary-category CSBA UFWs under the 80-Year version of the AMP. Why aren't the changes in the designated Expansion category components for the CSBA UFWs reflected in SLRA Appendix C?</p>	
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Assigned Technical Review Package (TRP): #16

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10	3.1-61 C-1 – C-10	<p>MRP-227, Rev. 1-A, Table 4-5, Item C5.2 for CSBA UGWs</p> <p>MRP-227, Rev. 1-A, Table 4-5, Item C5.3 for CSBA UAWs</p>	<p><b>AMR Items (two AMR items):</b> Core support barrel assembly (CSBA) upper girth welds (UGWs) and upper axial welds (UAWs)</p> <p>The gap analysis in SLRA Appendix C and the referenced AMR items for the CSBA UGWs and UAWs maintain the CSBA UGWs and UAWs as Expansion category components for the Primary-category CSBA upper flange welds (UFWs). Under the 60-year program, the CSBA UGWs and UAWs screen in for stress corrosion cracking (SCC) and neutron irradiation embrittlement (IE), where if the need for Expansion inspections of the UGWs and UAWs was triggered, the applicant would perform EVT-1 visual inspections of accessible UGW and UAW seams to look for visual evidence of cracking that might be indicative of IE occurring in the weld seams.</p>	<p>No issues with the AMR item.</p> <p>For the AMP and gap analysis basis, the CSBA UGWs and UAWs already screen in for SCC and IE. The applicant is requested to clarify whether the 80-year project fluence values for the UGWs and UAWs are high enough to screen the CSBA UGWs and UAWs in for irradiation-assisted stress corrosion cracking (IASCC) under the 80-Year version of the AMP.</p> <p>Applicant to confirm that the 80-year projected fluences are not sufficiently high where the CSBA UGWs or UAWs might otherwise need to be considered for elevation to Primary-category components – that is to confirm that the CBA UGWs and UAWs can remain as designated Expansion components for the Primary-category CSBA UFWs.</p>	

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11	3.1-61	NA	<p><b><i>AMR Items (two AMR items): Core support barrel assembly (CSBA) expandable plugs and patches (Unit 1 only)</i></b></p> <p>The SLRA includes one AMR line item in SLRA Table 3.1.2-2 on management of cracking in the CSBA expandable plugs and patches using the PWR Vessel Internals Program and another AMR item on managing loss of preload in the expandable plugs/patches using the TLAA defined for the components in SLRA Section 4.7.3, where the applicable TLAA has been projected to the end of the subsequent period of extended operation.</p> <p>The gap analysis in SLRA Appendix C does not really define the EPRI MRP inspection category and the type of inspections that will be applied to the CSBA expandable plugs and patches for St. Lucie Unit 1 under the 80-year version of PWR Vessel Internals Program (i.e., the SLR-based version of the AMP).</p>	<p>Given the applicable plant-specific TLAA for St. Lucie Unit 1 CSBA expandable plugs and patches (i.e., SLRA Section 4.7.3), the applicant should define the EPRI MRP inspection category and types of inspections that will be applied to the referenced Unit 1 expandable plugs and patches. If the plugs and patches are being placed in the Expansion-category of the AMP, the applicant should define which Primary-category components will be considered to be the lead component-specific indicators of aging for the Expansion-category CSBA expandable plugs and patches in Unit 1 and provide the acceptance criteria and expansion-link criteria for the applicable Primary-to-Expansion category inter-relationships.</p> <p>Additionally, in light of the applicable operating experience and the applicable TLAA, the applicant should be prepared to explain why the Unit 1 CSBA expandable plugs and patches are not being addressed on a component-specific basis in SLRA Appendix C.</p>	
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12	3.1-61	MRP-227, Rev. 1-A, Table 4-2, Item C7	<p><b>AMR Item:</b> <i>Core support barrel assembly (CSBA): core support barrel flexure welds</i></p> <p>The core support barrel flexure welds were designated by the EPRI MRP as Primary-category components for the 60-version of the PWR Vessel Internals Program, and will remain as Primary-category components for the 80-year version of the AMP (with no designated Expansion-category components). The flexure welds screened in for the cracking mechanisms of stress corrosion cracking (SCC) and fatigue for the 60-year version of the AMP.</p>	For the AMP, my only question is - will the 72 EPFY fluence exposures for the core support barrel flexure welds be high enough to screen the welds in for mechanisms of neutron irradiation embrittlement (IE), irradiation-assisted stress corrosion cracking (IASCC), or void swelling-distortion (VS-D)?	



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13	3.1-61	MRP-227, Rev. 1-A, Table 4-5, Item C6.3	<p><b>AMR Items (two AMR items total):</b>  <i>Lower support structure (LSS) core support columns</i></p> <p>The LSS core support columns were designated as Expansion-category components (with the linked Primary-category component being cited as the core support barrel assembly [CSBA] middle girth weld [MGW]) for the 60-year version of the PWR Vessel Internals Program, and presumably will remain as Expansion-category components for the 80-year version of the AMP (with no designated Expansion-category components). For the 60-Year version of the AMP, the LSS core support columns (made from cast austenitic stainless steel [CASS] materials) screened in for the cracking mechanisms of stress corrosion cracking (SCC), irradiation-assisted stress corrosion cracking (IASCC) and fatigue and the non-cracking mechanisms of neutron irradiation embrittlement (IE) and thermal aging embrittlement (TE).</p>	<p>For the 80-year version of the AMP, my main question is – are the CSBA lower girth welds (LGWs) additional Primary-category components for the LSS core support columns (i.e., in addition to the CSBA MGWs as linked Primary-category components) – if not, why not? The staff’s question is based on its current understanding that gap analysis for the 80-year version of the AMP is elevating the CSBA LGWs to Primary-category status (i.e., from Expansion-category status for the CSBA LGWs under the 60-Year version of the AMP).</p> <p>Additionally, are the lower core support columns made from cast austenitic stainless steel (CASS)? If so, based on the updated 80-year gap analysis assessment do they screen in for thermal aging embrittlement (i.e., TE in addition to IE)?</p>	

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14	3.1-61	MRP-227, Rev. 1-A, Table 4-2, Item C9	<p><b>AMR Items (two AMR items total):</b> <i>Lower support structure (LSS) core support plates</i></p> <p>The AMR table includes a line item on cracking and a line item on loss of fracture toughness (LOFT) of the LSS core support plates. For the 80-Year-based program, the LSS core support plates remain as Primary-category components for the AMP, with no designated/linked Expansion components. For the 60-year basis, the core support plates screened in for fatigue and irradiation embrittlement (IE) mechanism.</p>	<p>The AMR items are fine as long as the LSS core support plates do screen in for additional non-cracking effects. Are the 80-year projected fluences for the core support plates high enough where the components would also screen in for additional non-cracking effects (i.e., in addition to LOFT), such as for changes in dimension due to void swelling or distortion (CID/VS-D)? Additionally, are the combined 80-year projected fluences and stress loadings for the core support plates high enough to screen the core support plates in for irradiation-assisted stress corrosion cracking (IASCC)?</p>	
15  (#15 Cont.)	3.1-62	<p>NA for Welded CE Core Shroud Designs (like St. Lucie) with Two Vertical Shroud Sections</p> <p>(In Contrast, for welded CE core shroud designs that utilize full height shroud</p>	<p><b>AMR Items (two AMR items total):</b> <i>Upper internals assembly (UIA) fuel alignment plates</i></p> <p>The UIA fuel alignment plates in the upper internals assemblies are designated as new Expansion-category components for the program based on the updated 80-year gap analysis basis for the fuel alignment plates in SLRA Appendix C. On SLRA page C-6, the fuel alignment plates screen in (per MRP-2018-022) for the cracking mechanisms</p>	<p>Why only “Expansion” category for the UIA fuel alignment plates? Had the St. Lucie reactor internals been designed with welded core shrouds that utilize full height shroud plates, the fuel alignment plates would be designated as Primary category components for the program per Item C10 in Table 4-2 of the MRP-227, Rev. 1-A report.</p>	

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(#15 Cont.)		plates, MRP-227, Rev. 1-A, Table 4-2, Item C10 – which has the UIA fuel alignment plate as a Primary-category component; this is NA for St. Lucie design)	of irradiation-assisted stress corrosion cracking (IASCC) and fatigue and for the non-cracking mechanisms of neutron irradiation embrittlement (IE) and wear. The SLR-based program links the Expansion-criteria for the fuel alignment plates to the Primary-category EVT-1 visual inspection that will be performed on the core support barrel assembly (CSBA) lower girth welds (LGWs).	<p>The applicant should discuss the aspects of the St. Lucie unit-specific core shroud and fuel alignment plate designs that would allow the fuel alignment plates to be placed in the Expansion-category for the program and why the linked Primary-category CSBA LGWs are expected to be lead indicators for cracking and IE. As part of this discussion, the applicant should also justify why the UIA fuel alignment plates at St. Lucie are not considered to be as susceptible to cracking (or IE) when compared to and contrasted against the designs of UIA fuel alignment plates in U.S. CE-design PWRs that utilize welded core shrouds with full height shroud plates.</p> <p>Additionally, the line item on page 3.1-62 for the UIA fuel alignment plates (as referenced to SLRA Table 1 Item 3.1-1, 119) links the applicable aging and degradation mechanism combinations as loss of material (LOM) due to wear and changes in dimension due to void swelling or distortion (CID/VS-D). But page</p>	

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				C-6 has the non-cracking mechanism combinations and LOM due to wear and loss of fracture toughness due to irradiation embrittlement (LOFT/IE). So the applicant should discuss and reconcile the differences in the report non-cracking effect and mechanisms for the line item on page 3.1-62 and the corresponding line item on SLRA page C-6.	
16	3.1-62	MRP-227, Rev. 1-A, Table 4-8, Items C13 and C14	<b>AMR Items (two AMR items total):</b> <i>Upper internals assembly (UIA) guide lugs, guide lug inserts, and bolts</i>	Applicant to confirm that these are the guide lugs, guide lug inserts, and bolts in the upper internals assembly and that the components remain as Existing Program-category components for the AMP.	
17	3.1-62	MRP-227, Rev. 1-A, Table 4-5, C5.4	<b>AMR Items (two AMR items total):</b> <i>Lower support structure (LSS) lower core support beams</i>  Remain as Expansion-category components for the AMP that are linked the EVT-1 inspections that will be performed on the Primary-category CSBA upper flange weld (UFW); the	Applicant to confirm that projected 80-year fluence and stress load combinations are not high enough to screen the support beams in for irradiation-assisted stress corrosion cracking (IASSC) and that the 80-year projected fluences for the support beams are not high enough to screen the support	

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			support beams screen in for cracking mechanisms of stress corrosion cracking (SCC) and fatigue.	beams in for loss of fracture toughness due to irradiation embrittlement (LOFT/IE).	
18	3.1-62	MRP-227, Rev. 1-A, Table 4-8, Items C15a and C15b	<p><b>AMR Items (two AMR items total):</b>  <i>Lower support structure (LSS) fuel alignment pins</i></p> <p>Remain as Existing Program-category components for the AMP; the fuel alignment pins screen in for cracking due to IASCC and fatigue; loss of material (LOM) due to wear, loss of fracture toughness due to irradiation embrittlement (LOFT/IE, and loss of preload due to irradiation-enhance stress relaxation or creep (LOP due to ISR/IC)</p>	No questions on the AMP and AMR bases for the Existing Program basis for the LSS fuel alignment pins	
19	3.1-62, 3.1-63	<p>MRP-227, Rev. 1-A, Table 4-2, Item C11</p> <p>MRP-227, Rev. 1-A, Table 4-5, Item C11.1</p>	<p><b>AMR Item:</b> <i>Core Element assembly (CEA) peripheral incore instrument (ICI) guide tubes (includes associated guide tube welds); CEA non-peripheral (remaining) ICI guide tubes</i></p> <p>The CEA peripheral ICI guide tubes remain as Primary-category components for the AMP, with the corresponding ICI guide tubes in the non-peripheral (remaining) CEAs being the linked Expansion category components. The components screen in for cracking due to fatigue or stress corrosion cracking (SCC).</p>	No questions on the AMR or SLR gap analysis-adjusted AMP bases for these components.	



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